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Hoffbeck

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[54] **HYBRID CORN PLANT AND SEED (3563)**

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Related U.S. Application Data

[63] Continuation of Ser. No. 649,791, Feb. 1, 1991, abandoned.

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[52] **U.S. Cl.** **800/200**; 800/250; 800/DIG. 56; 435/240.4; 435/240.49; 435/240.5

[58] **Field of Search** ..... 800/200, 205, 800/250, DIG. 56; 47/58, DIG. 16; 435/240.4, 240.45, 240.49, 240.5

[56] **References Cited**

PUBLICATIONS

Meghji et al. (1984) Crop Science vol. 24, pp. 545–549.

Phillips et al. (1988) *Corn & Corn Improvement* ASA Monograph #18, 3rd edition. pp. 345–349 & 356–357.

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[57] **ABSTRACT**

According to the invention, there is provided a hybrid corn plant, designated as 3563, produced by crossing two Pioneer Hi-Bred International, Inc. proprietary inbred corn lines. This invention thus relates to the hybrid seed 3563, the hybrid plant produced from the seed, and variants, mutants, and trivial modifications of hybrid 3563. This hybrid corn plant is characterized by excellent yield potential, good test weight, and fast drydown. It performs best from Indiana/Ohio West.

4 Claims, No Drawings

HYBRID CORN PLANT AND SEED (3563)

This application is a continuation of prior application Ser. No. 07/649,791, filed Feb. 1, 1991, now abandoned.

FIELD OF THE INVENTION

This invention is in the field of plant breeding, specifically hybrid corn breeding.

BACKGROUND OF THE INVENTION

The goal of plant breeding is to combine in a single variety/hybrid various desirable traits of the parental lines. For field crops, these traits may include resistance to diseases and insects, tolerance to heat and drought, reducing the time to crop maturity, greater yield, and better agronomic quality. With mechanical harvesting of many crops, uniformity of plant characteristics such as germination and stand establishment, growth rate, maturity, and fruit size, is important.

Field crops are bred through techniques that take advantage of the plant's method of pollination. A plant is self-pollinating if pollen from one flower is transferred to the same or another flower of the same plant. A plant is cross-pollinated if the pollen comes from a flower on a different plant.

Plants that have been self-pollinated and selected for type for many generations become homozygous at almost all gene loci and produce a uniform population of true breeding progeny. A cross between two homozygous lines produces a uniform population of hybrid plants that may be heterozygous for many gene loci. A cross of two plants each heterozygous at a number of gene loci will produce a population of hybrid plants that differ genetically and will not be uniform.

Corn plants (*Zea mays. L.*) can be bred by both self-pollination and cross-pollination techniques. Corn has male flowers, located on the tassel, and female flowers, located on the ear, on the same plant. Natural pollination occurs in corn when wind blows pollen from the tassels to the silks that protrude from the tops of the incipient ears.

The development of corn hybrids requires the development of homozygous inbred lines, the crossing of these lines, and the evaluation of the crosses. Pedigree breeding and recurrent selection breeding methods are used to develop inbred lines from populations. Breeding programs combine desirable traits from two or more inbred lines or various broad-based sources into breeding pools from which new inbred lines are developed by selfing and selection of desired phenotypes. The new inbreds are crossed-with other inbred lines and the hybrids from these crosses are evaluated to determine which have commercial potential.

Pedigree breeding starts with the crossing of two genotypes, each of which may have one or more desirable characteristics that is lacking in the other or which complement the other. If the two original parents do not provide all of the desired characteristics, other sources can be included in the breeding population. In the pedigree method, superior plants are selfed and selected in successive generations. In the succeeding generations the heterozygous condition gives way to homogeneous lines as a result of self-pollination and selection. Typically in the pedigree method of breeding five or more generations of selfing and selection is practiced. $F_1 \rightarrow F_2$; $F_2 \rightarrow F_3$; $F_3 \rightarrow F_4$; $F_4 \rightarrow F_5$, etc.

A hybrid corn variety is the cross of two inbred lines, each of which may have one or more desirable characteristics lacked by the other or which complement the other. The hybrid progeny of the first generation is designated F_1. In the development of hybrids only the F_1 hybrid plants are sought. The F_1 hybrid is more vigorous than its inbred parents. This hybrid vigor, or heterosis, can be manifested in many ways, including increased vegetative growth and increased yield.

The development of a hybrid corn variety involves three steps: (1) the selection of superior plants from various germplasm pools; (2) the selfing of the superior plants for several generations to produce a series of inbred lines, which although different from each other, each breed true and are highly uniform; and (3) crossing the selected inbred lines with unrelated inbred lines to produce the hybrid progeny (F_1). During the inbreeding process the vigor of the lines decreases. Vigor is restored when two unrelated inbred lines are crossed to produce the hybrid progeny (F_1). An important consequence of the homozygosity and homogeniety of the inbred lines is that the hybrid between any two inbreds will always be the same. Once the inbreds that give the best hybrid have been identified, the hybrid seed can be reproduced indefinitely as long as the homogeneity of the inbred parents is maintained.

A single cross hybrid is produced when two inbred lines are crossed to produce the F_1 progeny. A double cross hybrid, is produced from four inbred lines crossed in pairs (A×B and C×D) and then the two F_1 hybrids are crossed again (A×B)×(C×D). Much of the hybrid vigor exhibited by F_1 hybrids is lost in the next generation (F_2). Consequently, seed from hybrid varieties is not used for planting stock.

Hybrid corn seed can be produced by manual detasseling. Alternate strips of two inbred varieties of corn are planted in a field, and the pollen-bearing tassels are removed from one of the inbreds (female). Providing that there is sufficient isolation from sources of foreign corn pollen, the ears of the detasseled inbred will be fertilized only from pollen from the other inbred (male), and the resulting seed is therefore hybrid and will form hybrid plants.

The laborious detasseling process can be avoided by using cytoplasmic male-sterile (CMS) inbreds. Plants of a CMS inbred are fertilized with pollen from another inbred that is not male-sterile. Pollen from the second inbred can contribute genes that make the hybrid plants male-fertile. Usually seed from detasseled normal corn and CMS produced seed of the same hybrid is blended to insure that adequate pollen loads are available for fertilization when the hybrid plants are grown.

Corn is an important and valuable field crop. Thus, a continuing goal of plant breeding is to develop stable high yielding corn hybrids that are agronomically sound. The reasons for this goal are obvious: to maximize the amount of grain produced on the land used and to supply food for both animals and humans.

SUMMARY OF THE INVENTION

According to the invention, there is provided a hybrid corn plant, designated as 3563, produced by crossing two Pioneer Hi-Bred International, Inc. proprietary inbred corn lines. This invention thus relates to the hybrid seed 3563, the hybrid plant produced from the seed, and variants, mutants, and trivial modifications of hybrid 3563. This hybrid corn plant is characterized by excellent yield potential, good test weight, and fast drydown. It performs best from Indiana/Ohio West.

DEFINITIONS

In the description and examples that follow, a number of terms are used herein. In order to provide a clear and consistent understanding of the specification and claims, including the scope to be given such terms, the following definitions are provided:

ADVANTAGE=It is the advantage the hybrid to be patented has compared to another hybrid for yield (bushels per acre), moisture (drier is an advantage), income, population, stand (plants not stalk lodging is an advantage), roots (plants not root lodging is an advantage), and test weight, respectively, in strip tests.

BAR PLT=BARREN PLANTS. This is the percent of plants per plot that were not barren (lack ears).

B/STK=BRITTLE STALKS RATING. This is a 1–9 rating where a 1, 5, and 9 represent serious, average, and little or no potential for brittle stalk breakage.

BRT STK=BRITTLE STALKS. This is a measure of the stalk breakage near the time of pollination, and is an indication of whether a hybrid would snap or break near the time of flowering under severe winds. Data are presented as percentage of plants that did not snap.

BU ACR=YIELD (BUSHELS/ACRE). Actual yield of the grain at harvest adjusted to 15.5% moisture. ABS is in absolute terms and % MN is percent of the mean for the experiments in which the hybrid was grown.

D/D=DRYDOWN. This represents the relative rate at which a hybrid will reach acceptable harvest moisture compared to other hybrids on a 1–9 rating scale. A high score indicates a hybrid that dries relatively fast while a low score indicates a hybrid that dries slowly.

D/E=DROPPED EARS RATING. This is a 1–9 rating where a 1, 5, and 9 represent serious, average, and little or no ear droppage potential, respectively.

DRP EAR=DROPPED EARS. This is a measure of the number of dropped ears per plot and represents the percentage of plants that did not drop ears prior to harvest.

D/T=DROUGHT TOLERANCE. This represents a 1–9 rating for drought tolerance, and is based on data obtained under stress conditions. A high score indicates good drought tolerance and a low score indicates poor drought tolerance.

E/HT=EAR HEIGHT RATING. This is a 1–9 rating with a 1, 5, and 9 representing a very low, average, and very high ear placement, respectively.

EAR HT=EAR HEIGHT. The ear height is a measure from the ground to the top developed ear node attachment and is measured in inches.

EST CNT=EARLY STAND COUNT. This is a measure of the stand establishment in the spring and represents the number of plants that emerge on a per plot basis for the hybrid.

GDU BL=GDU TO BLACKLAYER. This is the number of growing degree units required for the hybrid to reach blacklayer from the time that it was planted. Growing degree units are calculated by the Barger Method, where the heat units for a 24-hour period are:

$$GDU = \frac{(\text{Max.} + \text{Min.})}{2} - 50$$

The highest maximum used is 86° F. and the lowest minimum used is 50° F. For each inbred or hybrid it takes a certain number of GDUs to reach various stages of plant development.

GDU SHD=GDU TO SHED. The number of growing degree units (GDUs) or heat units required for a hybrid to have approximately 50 percent of the plants shedding pollen and is measured from the time of planting.

GDU SLK=GDU TO SILK. The number of growing degree units required for a hybrid to have approximately 50 percent of the plants with silk emergence from time of planting.

GRN APP=G/A=GRAIN APPEARANCE. This is a 1 to 9 rating for the general quality of the shelled grain as it is harvested based on such factors as the color of the harvested grain, any mold on the grain, and any cracked grain. High scores indicate good grain quality and low scores indicate poor grain quality.

H/POP=YIELD AT HIGH DENSITY. Yield ability at relatively high plant densities on a 1–9 relative rating system with a higher number indicating the hybrid responds well to high plant densities for yield relative to other hybrids. A 1, 5, and 9 would represent very poor, average, and very good yield response, respectively, to increased plant density.

INCOME/ACRE: Relative income per acre assuming drying costs of two cents per point above 15.5 percent harvest moisture and market price of $2.25 per bushel.

L/POP=YIELD AT LOW DENSITY. Yield ability at relatively low plant densities on a 1–9 relative system with a higher number indicating the hybrid responds well to low plant densities for yield relative to other hybrids. A 1, 5, and 9 would represent very poor, average, and very good yield response, respectively, to low plant density.

MST=MOIST=HARVEST MOISTURE. Harvest moisture is the actual percentage moisture of the grain at harvest.

MST RM=MOISTURE RM. This represents the Minnesota Relative Maturity Rating (MN RM) for the hybrid and is based on the harvest moisture of the grain relative to a standard set of checks of previously determined MN RM rating. Linear regression analysis is used to compute this rating.

P/HT=PLANT HEIGHT RATING. This is a 1–9 rating with a 1, 5, and 9 representing a very short, average, and very tall hybrid, respectively.

PLT HT=PLANT HEIGHT. This is a measure of the height of the plant from the ground to the tip of the tassel in inches.

POP K/ACRE: Plants per 0.001 acre.

PERCENT WINS: For yield, moisture, income, populations, stand, roots, and test weight, it would be the percentage of comparisons that the hybrid to be patented yielded more, had lower harvest moisture percentage, had greater income per acre, had better stalks, had better roots, and had higher test weight, respectively, in strip tests.

R/L=ROOT LODGING RATING. A 1–9 rating where a higher score indicates less root lodging potential (1 is very poor, 5 is intermediate, and 9 is very good, respectively, for resistance to root lodging).

ROOT (%): Percentage of plants that did not root lodge (lean greater than 30 degrees from vertical) taken on strip test plots.

RT LDG=ROOT LODGING. Root lodging is the percentage of plants that do not root lodge; plants that lean from the vertical axis at an approximately 30° angle or greater would be counted as root lodged.

S/L=STALK LODGING RATING. This is a 1–9 rating where a higher score indicates less stalk lodging potential (1 is very poor, 5 is intermediate, and 9 is very good, respectively, for resistance to stalk lodging).

SDG VGR=S/VIG=SEEDLING VIGOR. This is the visual rating (1 to 9) of the amount of vegetative growth after emergence at the seedling stage (approximately five leaves). A higher score indicates better vigor and a low score indicates poorer vigor.

STA GRN=STGR=STAY GREEN. Stay green is the measure of plant health near the time of black layer formation (physiological maturity) using a 1–9 visual rating. A high score indicates better late-season plant health and a low score indicates poor plant health.

STAND (%): Percentage of plants that did not break (lodge) below the ear taken on strip test plots.

STK LDG=STALK LODGING. This is the percentage of plants that did not stalk lodge (stalk breakage) as measured by either natural lodging or pushing the stalks and determining the percentage of plants that break below the ear.

T/WT=TEST WEIGHT RATING. This is a 1–9 relative rating with a 1, 5, and 9 indicating very low, average, and very high test weight, respectively.

TST WTA=TEST WEIGHT. The measure of the weight of the grain in pounds for a given volume (bushel) adjusted for percent moisture.

YLD=YIELD FOR MATURITY. This represents a 1–9 rating for a hybrid's yield potential. 1, 5, and 9 would represent very poor, average, and very high yield potential, respectively, relative to other hybrids of a similar maturity.

DETAILED DESCRIPTION OF THE INVENTION

Pioneer Brand Hybrid 3563 is a single cross, yellow endosperm, dent corn hybrid with excellent yield potential. It has good test weight, good stalks and roots, and fast drydown. 3563 has good stand establishment, good northern leaf blight resistance, and excellent Goss' wilt resistance.

This hybrid has the following characteristics based on the descriptive data collected primarily at Johnston, Iowa.

VARIETY DESCRIPTION INFORMATION
HYBRID = PIONEER BRAND 3563

Type: Dent Region Best Adapted: Central Corn Belt

A. Maturity:
Minnesota Relative Maturity Rating (harvest moisture): 103
GDU's to Physiological Maturity (black layer): 2648
GDU's to 50% Silk: 1415

$$\text{GDU's} = \frac{\text{[Max. Temp. (<\_86° F.) + Min. Temp (>\_50° F.)]*}}{2} - 50$$

*If maximum is greater than 86 degrees fahrenheit, then 86 is used and if minimum is less than 50, then 50 is used. Heat units accumulated daily and can not be less than 0.

B. Plant Characteristics:
Plant height (to tassel tip): 269 cm
Length of top ear internode: 17 cm
Number of ears per stalk: Single
Ear height (to base of top ear): 84 cm
Number of tillers: None
Cytoplasm type: Normal

C. Leaf:
Color: Dark Green (B14)
Angle from Stalk: 30–60 degrees
Marginal Waves: Few (WF9)
Number of Leaves (mature plants): 18
Sheath Pubescence: Light (W22)
Longitudinal Creases: Few (OH56A)
Length (Ear node leaf): 86 cm
Width (widest point, ear node leaf): 11 cm

D. Tassel:
Number lateral branches: 3
Branch Angle from central spike: 30–40 degrees
Pollen Shed: Heavy (KY21)
Peduncle Length (top leaf to basal branches): 25 cm
Anther Color: Pink
Glume Color: Green

E. Ear (Husked Ear Data Except When Stated Otherwise):
Length: 19 cm
Weight: 205 gm
Mid-point Diameter: 44 mm
Silk Color: Salmon
Husk Extension (Harvest stage): Short (Ears Exposed)
Husk Leaf: Short (<8 cm)
Taper of Ear: Slight
Position of Shank (dry husks): Upright
Kernel Rows: Straight, Distinct Number = 16
Husk Color (fresh): Light Green
Husk Color (dry): Buff
Shank Length: 11 cm
Shank (No. of internodes): 8

F. Kernel (Dried):
Size (from ear mid-point)

Length:	12 mm
Width:	7 mm
Thick:	4 mm

Shape Grade (% rounds): <20
Pericarp Color: Colorless
Aleurone Color: Homozygous Yellow
Endosperm Color: Yellow
Endosperm Type: Normal Starch
Gm Wt/100 Seeds (unsized): 26 gm

G. Cob:
Diameter at mid-point: 24 mm
Strength: Strong
Color: Red

H. Diseases:
Corn Lethal Necrosis (MCMV = Maize Chlorotic Mottle Virus and MDMV = Maize Dwarf Mosaic Virus): Intermediate
Common Smut (*U. maydis*): Highly Resistant
N. Leaf Blight (*E. turcicum*): Resistant
Gray Leaf Spot (*C. zeae*): Susceptible
Goss's Wilt (*C. nebraskense*): Resistant
Head Smut (*S. reiliana*): Highly Resistant
Fusarium Ear Mold (*F. moniliforme*): Resistant
Gibberella Ear Rot (*G. zeae*): Intermediate

I. Insects:
European Corn Borer-1 Leaf Damage (Pre-flowering): Intermediate
European Corn Borer-2 (Post-flowering): Intermediate
The above descriptions are based on a scale of 1–9, 1 being highly susceptible, 9 being highly resistant.
S (Susceptible): Would generally represent a score of 1–3.
I (Intermediate): Would generally represent a score of 4–5.
R (Resistant): Would generally represent a score of 6–7.
H (Highly Resistant): Would generally represent a score of 8–9. Highly resistant does not imply the inbred is immune.

J. Variety Most Closely Resembling:

Character	Hybrid
Maturity	Pioneer Brand 3578
Usage	Pioneer Brand 3578

Items B, C, D, E, F, and G are based on a maximum of two reps of data primarily from Johnston, Iowa in 1990.

This invention includes the hybrid corn seed of 3563, the hybrid corn plant produced from the hybrid corn seed, and variants, mutants, and modifications of 3563. This invention also relates to the use of 3563 in producing three-way and double cross hybrids.

The terms variant, trivial modification, and mutant refer to a hybrid seed where a plant produced by that hybrid seed which is phenotypically similar to 3563.

As used herein, the term "plant" includes plant cells, plant protoplast, plant cell or tissue culture from which corn plants can be regenerated, plant calli, plant clumps and plant cells that are intact in plants or parts of plants, such as flowers, kernels, ears, cobs, leaves, husks, stalks and the like.

Tissue culture of corn is described in European Patent Application, publication number 160,390, incorporated herein by reference. Corn tissue culture procedures are also described in Green and Rhodes, "Plant Regeneration in Tissue Culture of Maize," *Maize for Biological Research*, (*Plant Molecular Biology* Association, Charlottesville, Va. 1982) at 367–372 and in Duncan, et al., "The Production of Callus Capable of Plant Regeneration from Immature Embryos of Numerous *Zea Mays Genotypes,*" 165 *Planta* 322–332 (1985).

USES OF CORN

Corn is used as human food, livestock feed, and as raw material in industry. The food uses of corn, in addition to human consumption of corn kernels, include both products of dry- and wet-milling industries. The principal products of corn dry milling are grits, meal and flour. The corn wet-milling industry can provide starch, syrups, and dextrose for food use. Corn oil is recovered from corn germ, which is a by-product of both dry- and wet-milling industries.

Corn is also used extensively as livestock feed primarily to beef cattle, dairy cattle, hogs, and poultry.

Industrial uses of corn are mainly from corn starch from the wet-milling industry and corn flour from the dry-milling industry. The industrial applications of corn starch and flour are based on functional properties, such as viscosity, film formation, adhesive properties, and ability to suspend particles. The corn starch and flour have application in the paper and textile industries. Other industrial uses include applications in adhesives, building materials, foundry binders, laundry starches, explosives, oil-well muds, and other mining applications.

Plant parts other than the grain of corn are also used in industry. Stalks and husks are made into paper and wallboard and cobs are used for fuel and to make charcoal.

The seed of 3563, the hybrid corn plant produced from the seed, and various parts of the hybrid corn plant can be utilized for human food, livestock feed, and as a raw material in industry.

EXAMPLE 1

Research Comparisons for Pioneer Hybrid 3563

Comparisons of the characteristics for Pioneer Brand Hybrid 3563 were made against Pioneer Brand Hybrids 3615, 3578, and 3475; and DeKalb Brand Hybrid DK535. These hybrids are grown in the Western Corn Belt and are similar maturity. The results in Table 1A compare Pioneer Brand 3563 to Pioneer Brand Hybrid 3615. 3563 has higher yield, grain moisture, and test weight than 3615. 3563 is taller in stature, has lower ear placement, and flowers (GDU Shed) later than 3615. 3563 has better grain appearance and stay green, better resistance to stalk lodging, and is more susceptible to root lodging than 3615.

The results in Table 1B, comparing Pioneer Brand Hybrid 3563 to Pioneer Brand Hybrid 3578, show 3563 has higher yield and test weight, but lower grain moisture than 3578. 3563 has fewer barren stalks and establishes a better early stand than 3578. 3563 is a taller hybrid, has lower ear placement, and flowers (GDU Shed) later than 3578. 3563 has better grain appearance and stay green, is more susceptible to stalk and root lodging, and has fewer brittle stalks than 3578.

Table 1C compares Pioneer Brand Hybrid 3563 to Pioneer Brand Hybrid 3475. 3563 and 3475 have similar yield, but 3563 has lower grain moisture and slightly higher test weight than 3475. 3563 is a taller hybrid with lower ear placement and flowers (GDU Shed) later than 3475. 3563 is more susceptible to root lodging than 3475.

Table 1D, comparing Pioneer Brand Hybrid 3563 to DeKalb Brand Hybrid DK535, shows 3563 yields slightly higher, has lower grain moisture, and higher test weight than DK535. 3563 is taller in stature with higher ear placement and flowers (GDU Shed) later than DK535. 3563 has better grain appearance and stay green than DK535. 3563 is more susceptible to stalk lodging, but has better root lodging resistance than DK535.

TABLE 1A

VARIETY #1-3563
VARIETY #2-3615

YEAR	VAR #	BU ACR ABS	BU ACR % MN	MST ABS	BAR PLT ABS	PLT HT ABS	EAR HT ABS	SDG VGR ABS	EST CNT ABS
88	1	127.4	114	21.3	90.5	91.9	36.6	6.0	59.2
	2	106.3	97	19.1	97.0	85.9	37.5	6.4	60.7
	LOCS	21	21	21	3	10	10	13	19
	PROB	.000#	.001#	.000#	.217	.002#	.382	.310	.184
89	1	150.4	106	17.5		111.5	45.1	5.6	63.4
	2	133.6	94	17.5		105.3	46.0	6.1	63.7
	LOCS	45	45	45		17	17	19	24
	PROB	.000#	.000#	.892		.000#	.449	.256	.671
90	1	144.6	100	19.9		101.9	44.2	5.1	62.2
	2	134.2	93	18.7		94.7	45.3	5.7	60.8
	LOCS	100	100	100		47	47	52	69
	PROB	.000#	.000#	.000#		.000#	.030+	.000#	.010+
TOTAL	1	144.0	104	19.4	90.5	102.7	43.4	5.4	61.9
SUM	2	130.5	94	18.4	97.0	96.0	44.4	5.9	61.4
	LOCS	166	166	166	3	74	74	84	112
	DIFF	13.5	10	1.0	6.4	6.8	1.0	0.5	0.5
	PROB	.000#	.000#	.000#	.217	.000#	.018+	.000#	.192

TABLE 1A-continued

VARIETY #1-3563
VARIETY #2-3615

YEAR	VAR #	DRP EAR ABS	GDU SHD ABS	TST WTA ABS	GRN APP ABS	STA GRN ABS	STK LDG ABS	RT LDG ABS	BRT STK ABS
88	1	100.0	1369	57.5	6.9	5.5	89.6	97.7	
	2	99.7	1302	55.3	6.2	2.8	80.3	100.0	
	LOCS	15	7	20	16	14	18	2	
	PROB	.223	.000#	.000#	.053*	.000#	.025+	.500	
89	1	99.5	1304	58.3	6.5	5.3	93.5	97.5	99.5
	2	99.4	1257	57.2	6.4	2.9	90.1	99.2	100.0
	LOCS	39	13	44	31	16	40	33	2
	PROB	.682	.000#	.000#	.543	.000#	.023+	.102	.500
90	1	99.8	1377	56.7	6.7	5.2	92.3	93.9	99.3
	2	99.7	1302	55.3	6.5	1.8	89.6	95.7	98.0
	LOCS	68	25	99	82	46	99	33	3
	PROB	.260	.000#	.000#	.193	.000#	.007#	.362	.455
TOTAL	1	99.7	1355	57.2	6.7	5.3	92.3	95.8	99.4
SUM	2	99.6	1289	55.8	6.4	2.2	88.6	97.5	98.8
	LOCS	122	45	163	129	76	157	68	5
	DIFF	0.1	66	1.4	0.2	3.0	3.7	1.7	0.6
	PROB	.231	.000#	.000#	.037+	.000#	.000#	.097*	.539

* = 10% SIG
+ = 5% SIG
# = 1% SIG

TABLE 1B

VARIETY #1-3563
VARIETY #2-3578

YEAR	VAR #	BU ACR ABS	BU ACR % MN	MST ABS	BAR PLT ABS	PLT HT ABS	EAR HT ABS	SDG VGR ABS	EST CNT ABS
88	1	125.6	110	20.5	93.0	85.5	35.0	5.8	58.6
	2	114.7	101	21.3	89.1	78.5	36.0	6.1	58.2
	LOCS	22	22	22	2	9	9	11	16
	PROB	.010+	.039+	.012+	.265	.002#	.386	.295	.576
89	1	148.8	104	18.0		115.1	46.9	5.7	61.4
	2	141.7	99	19.2		110.3	46.7	5.8	60.2
	LOCS	63	63	63		24	24	31	39
	PROB	.001#	.001#	.000#		.000#	.796	.790	.185
90	1	147.7	102	20.3		101.5	42.7	5.1	59.3
	2	147.8	101	21.7		97.1	43.7	5.4	55.0
	LOCS	226	226	229		105	105	132	163
	PROB	.907	.873	.000#		.000#	.014+	.011+	.000#
TOTAL	1	146.3	103	19.9	93.0	102.8	43.0	5.3	59.6
SUM	2	144.2	101	21.2	89.1	98.2	43.7	5.5	56.2
	LOCS	311	311	314	2	138	138	174	218
	DIFF	2.1	2	1.3	4.0	4.6	0.8	0.2	3.4
	PROB	.028+	.015+	.000#	.265	.000#	.018+	.011+	.000#

YEAR	VAR #	DRP EAR ABS	GDU SHD ABS	TST WTA ABS	GRN APP ABS	STA GRN ABS	STK LDG ABS	RT LDG ABS	BRT STK ABS
88	1	100.0	1395	57.7	6.7	5.1	87.1	98.5	
	2	99.6	1345	55.5	6.0	4.5	94.0	99.0	
	LOCS	17	7	21	22	12	20	3	
	PROB	.029+	.001#	.000#	.166	.215	.032+	.794	
89	1	99.5	1310	58.1	6.6	5.2	91.2	97.6	99.5
	2	98.3	1265	56.7	5.7	5.0	94.0	98.3	99.0
	LOCS	46	18	62	41	23	58	35	2
	PROB	.000#	.000#	.000#	.000#	.592	.001#	.520	.500
90	1	99.7	1388	56.6	6.4	5.1	91.8	96.1	98.8
	2	99.3	1333	55.0	5.9	4.9	93.3	96.3	96.5
	LOCS	176	71	228	162	113	227	80	11
	PROB	.000#	.000#	.000#	.000#	.058*	.006#	.773	.046+
TOTAL	1	99.7	1374	57.0	6.5	5.1	91.4	96.6	98.9
SUM	2	99.1	1321	55.4	5.8	4.9	93.5	97.0	96.9
	LOCS	239	96	311	225	148	305	118	13
	DIFF	0.6	53	1.6	0.6	0.3	2.1	0.3	2.0
	PROB	.000#	.000#	.000#	.000#	.023+	.000#	.560	.038+

TABLE 1B-continued

VARIETY #1-3563
VARIETY #2-3578

YEAR	VAR #	BU ACR ABS	BU ACR % MN	MST ABS	BAR PLT ABS	PLT HT ABS	EAR HT ABS	SDG VGR ABS	EST CNT ABS
88	1	127.2	110	21.1	90.5	90.4	36.3	5.9	59.2
	2	113.5	100	22.1	92.2	77.4	35.1	6.0	57.6
	LOCS	27	27	27	3	12	12	15	19
	PROB	.006#	.041+	.002#	.735	.000#	.476	.923	.070*
89	1	148.4	103	18.2		115.3	47.3	5.7	61.9
	2	148.0	103	20.5		104.5	46.9	5.9	61.7
	LOCS	65	65	65		25	25	29	41
	PROB	.872	.907	.000#		.000#	.591	.622	.807
90	1	147.7	101	20.0		101.3	45.2	5.1	60.1
	2	150.4	102	21.4		94.3	46.0	5.4	58.4
	LOCS	206	206	206		96	96	105	142
	PROB	.021+	.050*	.000#		.000#	.036+	.025+	.000#
TOTAL SUM	1	146.0	102	19.7	90.5	102.9	44.8	5.3	60.4
	2	146.5	102	21.2	92.2	94.7	45.2	5.5	59.0
	LOCS	298	298	298	3	133	133	149	202
	DIFF	0.5	0	1.5	1.6	8.3	0.4	0.2	1.4
	PROB	.609	.939	.000#	.735	.000#	.251	.044+	.000#

* = 10% SIG
+ = 5% SIG
# = 1% SIG

TABLE 1C

VARIETY #1-3563
VARIETY #2-3475

YEAR	VAR #	DRP EAR ABS	GDU SHD ABS	TST WTA ABS	GRN APP ABS	STA GRN ABS	STK LDG ABS	RT LDG ABS	BRT STK ABS
88	1	100.0	138.9	57.3	6.7	5.3	88.2	98.5	
	2	99.4	136.5	56.6	6.6	5.0	90.7	99.6	
	LOCS	21	9	26	22	16	24	3	
	PROB	.032+	.027+	.002#	.882	.584	.267	.423	
89	1	99.5	131.1	57.9	6.4	5.3	90.4	97.6	99.5
	2	98.8	128.2	57.9	6.7	5.5	90.7	98.6	99.0
	LOCS	47	17	64	43	24	59	34	2
	PROB	.008#	.003#	.918	.099*	.570	.780	.379	.500
90	1	99.8	136.6	56.7	6.6	5.0	91.2	95.7	98.7
	2	99.4	132.8	56.3	6.5	4.7	90.5	97.3	98.3
	LOCS	132	59	205	167	111	204	53	10
	PROB	.001#	.000#	.000#	.545	.064*	.205	.166	.659
TOTAL SUM	1	99.7	1357	57.0	6.5	5.1	90.8	96.5	98.8
	2	99.3	1323	56.7	6.6	4.9	90.6	97.8	98.4
	LOCS	200	85	295	232	151	287	90	12
	DIFF	0.5	34	0.3	0.0	0.2	0.3	1.4	0.4
	PROB	.000#	.000#	.000#	.882	.122	.617	.089*	.571

* = 10% SIG
+ = 5% SIG
# = 1% SIG

TABLE 1D

VARIETY #1-3563
VARIETY #2-DK535

YEAR	VAR #	BU ACR ABS	BU ACR % MN	MST ABS	PLT HT ABS	EAR HT ABS	SDG VGR ABS	EST CNT ABS	DRP EAR ABS
89	1	141.7	104	21.2	123.4	50.5	4.9	57.1	100.0
	2	134.0	98	22.0	113.7	48.3	5.7	57.6	99.0
	LOCS	11	11	11	6	6	5	9	11
	PROB	.338	.341	.096*	.001#	.258	.101	.708	.034+
90	1	145.1	100	19.7	101.6	43.8	5.0	60.5	99.8
	2	143.7	99	20.0	96.4	43.5	5.5	58.6	99.7
	LOCS	140	140	141	61	61	76	100	105
	PROB	.242	.205	.049+	.000#	.539	.001#	.001#	.143
TOTAL	1	144.9	100	19.8	103.5	44.4	5.0	60.3	99.8

TABLE 1D-continued

VARIETY #1-3563
VARIETY #2-DK535

SUM	2	143.0	99	20.2	98.0	43.9	5.5	58.6	99.6
	LOCS	151	151	152	67	67	81	109	116
	DIFF	1.9	1	0.3	5.6	0.5	0.5	1.7	0.2
	PROB	.134	.112	.020+	.000#	.324	.000#	.001#	.025+
YEAR		VAR #	GDU SHD ABS	GDU SLK ABS	TST WTA ABS	GRN APP ABS	STA GRN ABS	STK LDG ABS	RT LDG ABS
89	1	1329	56.6	6.3	6.4	87.2	99.0		
	2	1295	54.7	5.5	4.4	90.1	98.1		
	LOCS	4	11	11	6	10	5		
	PROB	.215	.001#	.007#	.015+	.488	.594		
90	1	1392	56.8	6.5	5.0	92.5	95.1	99.4	
	2	1346	54.6	5.6	3.4	93.9	90.7	98.5	
	LOCS	36	141	99	61	140	50	7	
	PROB	.000#	.000#	.000#	.000#	.037+	.029+	.359	
TOTAL	1	1392	56.8	6.5	5.1	92.1	95.5	99.4	
SUM	2	1341	54.6	5.6	3.5	93.6	91.4	98.5	
	LOCS	40	152	110	67	150	55	7	
	DIFF	52	2.2	0.9	1.6	1.5	4.1	1.0	
	PROB	.000#	.000#	.000#	.000#	.027+	.026+	.359	

* = 10% SIG
+ = 5% SIG
# = 1% SIG

EXAMPLE 2

Strip Test Data for Hybrid 3563

Comparison data was collected from strip tests that were grown by farmers. Each hybrid was grown in strips of 4, 6, 8, 12, etc. rows in fields depending on the size of the planter used. The data was collected from strip tests that had the hybrids in the same area and weighed. The moisture percentage was determined and bushels per acre was adjusted to 15.5 percent moisture. The number of comparisons represent the number of locations or replications for the two hybrids that were grown in the same field in close proximity and compared.

Comparison strip testing was done between Pioneer Brand Hybrid 3563 and Pioneer Brand Hybrids 3615, 3578, and 3475; and DeKalb Brand Hybrid DK535. The comparisons came from all the hybrid's adapted growing area in the United States.

These results are presented in Table 2. The results show Pioneer Brand Hybrid 3563 has a yield advantage over all compared hybrids except Pioneer Hybrid 3578 where it had a 0.4 (not statistically significant) bushels per acre disadvantage. Pioneer 3615 has a slight moisture advantage over 3563. 3563 showed a greater income advantage to the farmer based on the adjusted gross income over all hybrids compared. The yield and income advantage 3563 shows, plus its advantage for other characteristics over these hybrids will make it an important addition for most of the areas where these hybrids are grown.

TABLE 2

PIONEER HYBRID 3563 VS PIONEER HYBRIDS 3615, 3578, AND 3475; AND DEKALB BRAND HYBRID DK535 FROM 1990 STRIP TESTS

Brand	Product	Yield	Moist	Income/ Acre	Pop K/Acre	Stand (%)	Roots (%)	Test Wt
PIONEER	3563	151.1	19.3	362.75	24.6	86	98	56.3
PIONEER	3615	142.8	18.5	345.17	24.3	79	100	55.0
Advantage		8.3	–0.8	17.58	0.3	7	–2	1.3
Number of Comparisons		211	211	211	118	99	69	174
Percent Wins		82	20	78	49	69	2	77
Probability of Difference		99	99	99	80	99	77	99
PIONEER	3563	155.0	20.0	369.85	25.1	86	98	56.3
PIONEER	3578	155.4	21.8	363.58	24.6	90	98	54.4
Advantage		–0.4	1.8	6.27	0.5	–4	0	1.9
Number of Comparisons		290	290	290	161	139	103	229
Percent Wins		48	88	60	52	36	16	85
Probability of Difference		47	99	99	99	99	9	99
PIONEER	3563	153.3	19.9	365.39	25.1	85	97	56.3
PIONEER	3475	152.0	22.0	354.23	23.9	84	98	55.5
Advantage		1.3	2.1	11.16	1.2	1	–1	0.8
Number of Comparisons		269	269	269	152	134	88	195
Percent Wins		55	92	68	63	55	7	64
Probability of Difference		97	99	99	99	90	91	99

TABLE 2-continued

PIONEER HYBRID 3563 VS PIONEER HYBRIDS 3615, 3578, AND 3475; AND DEKALB BRAND HYBRID DK535 FROM 1990 STRIP TESTS

Brand	Product	Yield	Moist	Income/ Acre	Pop K/Acre	Stand (%)	Roots (%)	Test Wt
PIONEER	3563	156.9	20.0	373.77	27.4	92	0	56.8
DEKALB	DK535	155.2	21.7	363.80	26.0	94	0	54.6
Advantage		1.7	1.7	9.97	1.4	–2	0	2.2
Number of Comparisons		13	13	13	11	8	0	9
Percent Wins		61	76	61	54	37	0	88
Probability of Difference		21	99	48	79	60	0	99
PIONEER	3563	153.4	19.8	366.47	25.0	86	97	56.3
WEIGHTED AVG		150.8	21.0	355.41	24.3	85	98	54.9
Advantage		2.6	1.2	11.06	0.7	1	–1	1.4
Number of Comparisons		783	783	783	442	380	260	607
Percent Wins		60	71	68	55	51	10	76
Probability of Difference		99	99	99	99	85	94	99

NOTE: The probability values are useful in analyzing if there is a "real" difference in the genetic potential of the products involved. High values are desirable, with 95% considered significant for real differences.

EXAMPLE 3

Comparison of Key Characteristics for Hybrid 3563

Characteristics of Pioneer Brand Hybrid 3563 are compared to Pioneer Brand Hybrids 3615 and 3578; and DeKalb Brand Hybrid DK535 in Table 3. The ratings given for most of the traits are on a 1–9 basis. In these cases 9 would be outstanding, while a 1 would be poor for the given characteristics. These values are based on performance of a given hybrid relative to other Pioneer commercial, precommercial, and competitive hybrids that are grown in research and strip test trials. The traits characterized in Table 3 were defined previously and the ratings utilized not only research data but experience that trained corn researchers had in the field as well as sales experience with the hybrids in strip test and in the field. These scores reflect the hybrid's relative performance to other hybrids for the characteristics listed. The table shows 3563 yielded well for its maturity, and yielded as well or better than the hybrids compared in both high and low plant population densities. 3563 has average stalk and root lodging resistance and comparable stay green to the hybrids compared. Relative to the hybrids compared, 3563 has higher test weight and better grain appearance. 3563 is a tall statured hybrid with low ear placement.

TABLE 3

HYBRID PATENT COMPARISONS-CHARACTERISTICS
Pioneer Hybrid 3563 vs Pioneer Hybrids 3615 and 3578; and DeKalb Hybrid DK535

HYBRID	SILK_CRM	GDU_SILK	BL_CRM	GDU_BL	CRM	YLD	H/POP	L/POP	D/D	S/L
3563	107	1415	103	2648	103	8	7	8	6	6
3615	104	1383	97	2564	102	6	6	6	4	4
3578	103	1363	102	2640	104	8	8	7	4	7
DK535	104				104	7	7	6	5	5

HYBRID	R/L	STGR	D/T	T/WT	G/A	S/VIG	P/HT	E/HT	D/E	B/STK
3563	6	6	5	6	6	5	6	4	6	5
3615	7	3	8	4	4	7	5	6	7	5
3578	6	6	5	4	5	7	5	5	5	5
DK535	4	2	4	4	4	6	4	3	5	4

Although the foregoing invention has been described in some detail by way of illustration and example for purposes of clarity and understanding, it will be obvious that certain changes and modifications may be practiced within the scope of the invention, as limited only by the scope of the appended claims.

DEPOSITS

Applicants have made a deposit of at least 2500 seeds of Hybrid Corn Line 3563 with the American Type Culture Collection (ATCC), Rockville, Md. 20852 USA, ATCC Deposit No. 97344. The seeds deposited with the ATCC an Nov. 27, 1995 were taken from the same deposit maintained by Pioneer Hi-Bred international, Inc., 700 Capital Square, 400 Locust Street, Des Moines, Iowa 50309-2340 since prior to the filing date of this application. This deposit of the Hybrid Corn Line 3563 will be maintained in the ATCC depository, which is a public depository, for a period of 30 years, or 5 years after the most recent request, or for the enforceable life of the patent, whichever is longer, and will be replaced if it becomes nonviable during that period. Additionally, Applicant has satisfied all the requirements of 37 C.F.R. §§1.801–1.809, including providing an indication of the viability of the sample. Applicant imposes no restrictions on the availability of the deposited material from the ATCC; however, Applicant has no authority to waive any restrictions imposed by law on the transfer of biological material or its transportation in commerce. Applicant does not waive any infringement of its rights granted under this patent.

What is claimed is:

1. A hybrid corn plant designated as 3563 and its parts, produced from seed having ATCC accession no. 97344.

2. Tissue culture according to claim 1, the tissue culture selected from the group consisting of leaves, pollen, embryos, roots, root tips, anthers, silk, flowers, kernels, ears, cobs, husks, stalks, and cells thereof, and protoplasts.

3. A tissue culture of the regenerable cells of the corn plant of claim 1, wherein the tissue culture regenerates plants having all the physiological and morphological characteristics of 3563.

4. A corn plant regenerated from the tissue culture of claim 3 having all of the physiological and morphological characteristics of 3563.

* * * * *